MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Borehole 10-01-03

Log Event A

Borehole Information

Farm : A	**Tank :** A-101	**Site Number :** 299-E25-91
N-Coord : 41,213	**W-Coord :** 47,757	**TOC Elevation :** 689.18
Water Level, ft :	**Date Drilled :** 4/30/1962	

Casing Record

Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 75	

Borehole Notes:

Borehole 10-01-03 was originally drilled in April 1962 and completed to a depth of 75 ft with 6-in.-diameter casing. There is no mention in the drilling log that the casing was perforated or grouted.

"As-built" drawings for the A Tank Farm indicate the original borehole was constructed with 6-in., schedule-30 pipe; however, this type of pipe was not identified in applicable engineering references. The casing thickness is assumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. casing.

The top of the casing is the zero reference for the log. The casing lip is approximately 6 in. above the ground surface.

Equipment Information

Logging System : 2	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 10/1996	**Calibration Reference :** GJO-HAN-13	**Logging Procedure :** P-GJPO-1783

Logging Information

Log Run Number :	1	**Log Run Date :**	01/07/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	78.5	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	40.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	2	**Log Run Date :**	01/08/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	41.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	7.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

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Log Run Number :	3	**Log Run Date :**	01/08/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	8.0	**Counting Time, sec.:**	100	**L/R :** R	**Shield :** N
Finish Depth, ft. :	2.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	4	**Log Run Date :**	01/08/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	2.5	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	0.5	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	5	**Log Run Date :**	01/08/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	30.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	10.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

This borehole was logged in five log runs. A 20-ft interval of the borehole was relogged as a quality assurance measure. The total logging depth achieved by the SGLS was 78.5 ft.

Analysis Information

Analyst : S.D. Barry

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 02/10/1998

Analysis Notes :

The pre- and post-survey field verification spectra for all logging runs met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from these spectra were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

Casing correction factors for a 0.280-in.-thick steel casing (based on a 6-in., schedule-40 pipe) were applied to the entire logged interval during the analysis process.

Shape factor analysis was applied to the SGLS data and provided insights into the distribution of Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

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A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A rerun plot for the interval between 10 and 30 ft is included.

A plot of the shape factor analysis results is included. The plot is used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.

A time-sequence plot of the historical gross gamma log data from 1975 to 1992 is presented with the log plots.

Results/Interpretations:

The man-made radionuclides Cs-137, Co-60, and Eu-154 were detected around this borehole. A region of high dead time was detected between 3.5 and 7 ft. Cs-137 contamination was detected continuously from the ground surface to 3 ft, continuously from 7.5 to 20.5 ft, just above the MDL at a depth of 26 ft, and nearly continuously from 67 ft to the bottom of the logged interval. Co-60 contamination was detected just above the MDL at 2.5 and 7 ft. Eu-154 contamination was detected from 2.5 to 3 ft and 7 to 7.5 ft.

The U-238 log plot shows an interval of slightly elevated concentration values between 30 and 40 ft. At a depth of 77 ft, the KUT concentration values begin to increase.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factor analysis for the interval from about 10 to 19 ft indicates the Cs-137 contamination is distributed in the backfill sediments.

The interval from 10 to 30 ft was relogged as a quality assurance measure. The comparison between the original log run and the rerun log was generally within the two-sigma uncertainty, indicating the excellent repeatability of the logging measurement.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Reports for tanks A-101 and A-102.